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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|-----------------|-------------|----------------------|---------------------|------------------|
| 10/032,478      | 01/02/2002  | Sang-Young Kim       | 259/010 CIP         | 5586             |

7590 11/05/2003  
Eugene M. Lee  
The Law Offices of Eugene M. Lee, PLLC  
1101 Wilson Boulevard, Suite 2000  
Arlington, VA 22209

EXAMINER

NORRIS, JEREMY C

| ART UNIT | PAPER NUMBER |
|----------|--------------|
|----------|--------------|

2827

DATE MAILED: 11/05/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

|                              |                                      |                                   |  |
|------------------------------|--------------------------------------|-----------------------------------|--|
| <b>Office Action Summary</b> | <b>Applicati n No.</b><br>10/032,478 | <b>Applicant(s)</b><br>KIM ET AL. |  |
|                              | <b>Examiner</b><br>Jeremy C. Norris  | <b>Art Unit</b><br>2827           |  |

**-- The MAILING DATE of this communication appears on the cov r sheet with the correspondenc address --**

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 03 July 2003.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-36 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-36 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 21 October 2002 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.  
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

**Priority under 35 U.S.C. §§ 119 and 120**

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All b) ☐ Some \* c) ☐ None of:  
1. ☐ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).  
\* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).  
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                             | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). _____  |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Review (PTO-948)                 | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ | 6) <input type="checkbox"/> Other: _____                                    |

**DETAILED ACTION**

***Continued Examination Under 37 CFR 1.114***

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 3 June 2003 has been entered.

***Claim Rejections - 35 USC § 112***

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 19-36 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. Each of the claims contains the limitation "a cavity enclosed by the exterior wall of the solder ball". However, it is physically impossible for the exterior wall to enclose a cavity. Examiner cannot ascertain what feature Applicants intend to claim by this language. Therefore, the claims have not been further treated on the merits.

***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claim 1 is rejected under 35 U.S.C. 102(e) as being anticipated by US 6,303,408 (hereafter Smith).

Smith discloses, referring to figure 1, an array of resilient solder bonding structures (22), each solder bonding structure comprising a solder ball (42) connecting a contact pad (26) on a first surface to a contact pad (32) on a second surface, each solder ball having a continuous curved exterior surface which together with the first surface and the contact pad of the first surface and with the second surface and the contact pad of the second surface, defines a total volume of the solder bonding structure and completely encloses an interior cavity (see col. 5, lines 40-50) defined by an interior surface of the solder bonding structure, the interior cavity having a displacement constituting a second volume, wherein the interior cavity is in direct contact with the interior surface of the solder bonding structure and the second volume is not less than about 1% and not more than about 90% of the total volume of the solder bonding structure [claim 1].

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 2 and 3 are rejected under 35 U.S.C. 103(a) as being unpatentable over Smith in view of US 5,767,580 (hereafter Rostoker).

Smith, as described above discloses the claimed invention except Smith does not specifically state the shape of the pads. However, it would have been obvious, to one having ordinary skill in the art, at the time of invention, to form the pads in either annular or circular shapes as both are well known in the art as evidenced by Rostoker (see figures 1b, 4a). Furthermore, it has been held that more than a mere change of

form is necessary for patentability. *Span-Deck, Inc v. Fab-Con, Inc.* (CA 8, 1982) 215 USPQ 835.

Claims 4, 7-9, 12-15, and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Smith in view of Applicants' Admitted Prior Art described with reference to figures 1 and 2 of the instant application (hereafter AAPA).

Regarding claims 4, 7, and 12, Smith discloses the claimed invention as described above except Smith does not specifically state that the invention is a BGA. However, it would have been obvious, to one having ordinary skill in the art, at the time of invention, to use a BGA as it is well known in the art to package chips in BGAS as evidenced by AAPA.

Moreover, AAPA teaches that the substrates may be either organic or inorganic, including ceramic and glass-epoxy, as both are well known in the art [claims 8, 9, 13-15, 18].

Claims 5, 6, 10, 11, 16, and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Smith in view of AAPA as applied to claims 4 & 7 above, and further in view of Rostoker.

Smith in view of AAPA, as described above discloses the claimed invention except Smith in view of AAPA does not specifically state the shape of the pads. However, it would have been obvious, to one having ordinary skill in the art, at the time of invention, to form the pads in either annular or circular shapes as both are well known

in the art as evidenced by Rostoker (see figures 1b, 4a). Furthermore, it has been held that more than a mere change of form is necessary for patentability. *Span-Deck, Inc v. Fab-Con, Inc.* (CA 8, 1982) 215 USPQ 835.

### ***Response to Arguments***

Applicant's arguments filed 3 June 2003 have been fully considered but they are not persuasive. Applicants contend "in the case there (sic) the cores are hollow, the 'interior cavity' of Smith is completely defined by the interior surface of the spherical cores. As such, the 'interior cavity' is never in direct contact with the fusible conductive material (i.e., solder material) that covers the cores, but instead is in direct contact with the interior surface of the hollow spherical cores. In contrast the 'interior cavity' of the present invention as claimed is defined not by the interior surface of a spherical, hollow core but is instead defined by the interior surface of the solder bonding or ball structure (i.e., the fusible conductive material - solder material)". However, this is a misinterpretation of the device of Smith. It would be clear to one of ordinary skill in the art that the "solder bonding structure" relied upon by the Examiner is the totality of "composite conductive element 22" disclosed by Smith. Nowhere in Smith would one of ordinary skill in the art find suggestion that the fusible material is separate in function from the (in this case hollow) core. Therefore, it is an interior surface of this composite structure which defines the "interior cavity". The "solder bonding structure" being the composite conductive element (22). Therefore, it is deemed that the traversal on this ground is unsuccessful.

Applicants further allege that AAPA does not resolve the purported deficiency of Smith. However, as noted above, Smith does indeed meet the claimed limitations. AAPA is only relied upon as evidence that BGAs are well known semiconductor structures, and that both organic substrates, such as those of glass-epoxy and inorganic substrates, such as those of ceramic materials, are well known to be employed in the art.

### ***Conclusion***

This is a Continued Examination of applicant's earlier Application No. 10/032,478. All claims are drawn to the same invention claimed in the earlier application and could have been finally rejected on the grounds and art of record in the next Office action if they had been entered in the earlier application. Accordingly, **THIS ACTION IS MADE FINAL** even though it is a first action in this case. See MPEP § 706.07(b). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no, however, event will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.




Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jeremy C. Norris whose telephone number is 703-306-5737. The examiner can normally be reached on Tuesday - Friday, 10am - 7pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kamand Cuneo can be reached on 703-308-1233. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

JCSN

  
KAMAND CUNEO  
PATENT EXAMINER  
CENTER 28